

551.586 : 632.1 : 633.174

EFFECT OF AGROCLIMATIC PARAMETERS ON EPIPHYTIC OF FOLIAR DISEASES OVER RABI SORGHUM GENOTYPES GROWN AT BIJAPUR, KARNATAKA, INDIA

1. The interrelationship between agro-climatic indices and foliar disease intensities amongst 14 rabi sorghum germplasm was envisaged at Regional Agricultural Research Station, (University of Agricultural Sciences, Dharwad) situated at Bijapur (Lat. 16° 49 N, Long. 75° 43 / E : 593 m a.m.s.l. and dry semiarid climate type in medium deep black soils) of north interior Karnataka meteorological sub-division during two rabi crop growing seasons of the year 1997 and 1998. This study was conducted to assess the true resistant behaviour of the genotypes under meteorologically two different years.

2. The study revealed that longer duration varieties (*viz.*, M 35-1) are found to be highly susceptible to both leaf rust and blight compared to shorter duration varieties (RS 29). The intensity and spread of the diseases in general in almost all the varieties is found to be severe during the year in which higher magnitude of thermal indices are accompanied by lower scale of moisture indices. It is also found that higher rainfall and longer hours of bright sunshine companionship followed by lesser relative humidity have minimized disease intensity. Moisture as well as wind regimes are noticed to have profound impact compared to thermal regime in causing occurrence and spread of foliar diseases over rabi sorghum crop.

3. Fourteen varieties of sorghum (*Sorghum vulgare Pers*) were sown on 30th September, *i.e.* 40th meteorological standard week (MSW) at receding phase of the southwest monsoon season during two years period of study. The experiment was conducted in randomized block design with three replications and plot size of 1.2 m × 4 m with 60 cm × 30 cm spacing, 60 : 30 : 30 kg/ha NPK was applied while raising the crop completely on rain fed conditions. Visual crop observations on diseases like leaf rust (*Puccinia sorghii*) and leaf blight (*Exhiorhilum turcium*) are recorded during study period at the time of maximum intensity epoch of the disease which usually noticed around 70 days of crop age (MSW 49). The disease grade is delineated according to Subrahmanyam *et al.* (1995) and presented in Table 1. Weather data during cropping season was recorded from meteorological observatory situated near by experimental plots. The relevant agro climatic indices prevailed upto peak diseases occurrence period (MSW 49) are

TABLE 1

Foliar disease intensity in grade of sorghum germ plasm observed at Bijapur during 1997 and 1998 rabi cropping season

S. No.	Genotype	Disease Grade			
		Leaf rust		Leaf blight	
		1997	1998	1997	1998
1.	BRJ-171	4.0(S)	3.0(MS)	4.0(S)	2.0(MR)
2.	BRJ-172	3.0(MS)	3.0(MS)	2.5(HR)	2.0 (MR)
3.	BRJ-182	3.0(MS)	3.0(MS)	4.0(S)	2.5(MR)
4.	BRJ-185	4.0(S)	3.5(MS)	4.0(S)	2.0 (MR)
5.	BRJ-187	3.0(MS)	3.0(MS)	3.0(MS)	2.5 (MR)
6.	BRJ-190	3.0(MS)	3.0(MS)	3.0(MS)	2.5 (MR)
7.	BRJ-192	4.0(S)	4.0(S)	4.0(S)	2.0(MR)
8.	BRJ-196	4.0(S)	3.0(MS)	4.0(S)	2.0(MR)
9.	BRJ-204	3.0(MS)	3.0(MS)	3.0(MS)	2.0(MR)
10.	BRJ-205	3.0(MS)	3.0(MS)	3.0(MS)	2.0(MR)
11.	M 35-1	4.0(S)	3.5(MS)	4.0(S)	2.0(MR)
12.	GRS 1	3.0(MS)	3.0(MS)	2.5(R)	2.0(MR)
13.	9-13	2.5(MR)	2.5(MR)	3.0(MS)	2.0(MR)
14.	RS-29	1.5(R)	1.0(HR)	1.0(HR)	1.5(R)

Note : The letters in the parenthesis indicate disease intensity figures as indicated by the disease intensity grade as given below.

Scale	Disease intensity reaction
5	Highly susceptible (HS)
4	Susceptible (S)
3	Moderately susceptible (MS)
2	Moderately resistant (MR)
1	Resistant (R)
0	Highly resistant (HR)

enumerated and shown in Table 2 alongwith prominent crop weather hazardous days.

4. From Table 1, it may be observed that leaf rust disease intensity was more severe during 1997 (5 and 7 varieties of susceptible and moderately susceptible nature respectively) compared to 1998 (1 and 11 varieties of susceptible and moderately susceptible nature respectively). All varieties are found to be resistant to leaf blight during the year 1998 while only 6 and 5 out of 14 varieties were found susceptible and moderately susceptible in nature respectively during 1997 (Table 1). Moisture regimes indicators such as wetness index ratio of actual rainfall to normal rainfall expressed as %, rainfall index of total rainfall and number of rainy days, ecological index (ratio of number of dry days to wet days expressed as %), crop moisture index (multiple of crop moisture adequacy ratio and Thornthwaites temperature index) and saturation coefficient (difference between

TABLE 2

Agro climatic indices prevailed from sowing till the time of occurrence of maximum intensity of the disease during the two years of study at Bijapur

S. No.	Agro climatic indices	1997	1998
1.	Heloithermal units (units/day)	83	78
2.	Photo thermal units (units/day)	150	147
3.	Temperature humidity combination index	58	54
4.	Wetness index (%)	121	190
5.	Rainfall index (%)	1840	3156
6.	Ecological index (%)	491	167
7.	Crop Moisture index (%)	56	57
8.	Wind through index (%)	41	40
9.	Photo thermal index	150	147
10.	Saturation coefficient	9.0	12.2
Crop weather hazardous days			
1.	Day and night temperature (°C)	Nil	Nil
2.	Maximum relative humidity (%)	41	11
3.	Hours of bright sunshine (hrs/day)	Nil	Nil
4.	Wind gusts (kmph)	Nil	Nil
5.	Open pan evaporation (mm/day)	Nil	Nil
6.	Rainfall (mm/day)	2	5

actual and saturation vapour pressure) are found to be lower magnitude during the year 1997 compared to 1998 (Table 2). The parameters that governed the severity of disease incidence are rainfall, relative humidity influencing the macro spread and leaf wetness index, crop wetness index and wind through index influencing the microclimatological conditions. These are responsible for severity of occurrence and spread of foliar disease on almost all the selected varieties during 1997 compared to 1998 (Ghadekar and Miskin, 1998).

5. Crop weather hazardous parameters like day (> 37.5° C) and night (< 5° C) anomalies during both years of study are found to be nil (Table 2). Thermal regime indicators (8° C assumed as base temperature while computing growing degree days) such as photo thermal index (ratio of accumulated growing degree days to 70 days of duration of observation), photo thermal units (multiple of accumulated growing degree days and normal hours of bright sunshine), heloithermal units (multiple of accumulated growing degree days and actual hours of bright sunshine) and temperature-humidity combination index (sum of dry bulb temperature and a constant times the mean relative humidity) are noticed to be higher during 1997 compared to 1998 (Table 2). This indicates that thermal regime next to moisture regime was found to have major influence to initiate and aggravate foliar diseases on sorghum varieties (Ghadekar *et al.*, 1985). The

crop weather anomalies with regard to rainfall (> 25.4 mm/day) and hours of bright sunshine (3 hrs/day) are observed to be higher during 1998 compared to 1997. (Table 2), the year in which days with morning relative humidity abnormality (> 80%) prevailed. This is proved to be one of the reasons for lesser susceptibility of most of the varieties to foliar diseases during 1998 compared to 1997 (Ramaswamy, 1968; Kagadi *et al.*, 2000).

6. Taking wind regime into consideration the wind through index (division of cubic power of wind speed to the square of potential evapotranspiration) was observed to be higher magnitude during 1997 compared to 1998 (Table 2). The crop weather abnormalities regarding gustiness of wind (single direction oriented wind speed > 19 kmph) and open water evaporation (> 10 mm/day or < 1mm/day) are nil. (Table 1). These wind regime factors are noticed to be responsible for aggravating the spread of higher foliar disease intensity during 1997 compared to 1998 which are in accordance with those findings of Navi *et al.* (1991).

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(16 August 2002, Modified 30 September 2004)